

From the author

(13.)

ON

RABIES AND THE HYDROPHOBIA.

BY

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Hydrophobiam ex morsu animalis rabiosi nunquam vidi.—HEBERDEN.

The history of the opinions that have prevailed regarding the disease called Hydrophobia occurring in dogs, other domesticated animals, and the human species, is, if not a flattering, a curious illustration of the manner in which diseases are sometimes described and the nature of their pathology decided upon. The dog was probably the first animal domesticated by man, and from a very early period he has been noticed (in temperate climates at least¹) to be liable to a disease anciently called lyssa. Of this malady delirium is a symptom, and one very common action of a delirious dog is to snap, sometimes at himself and sometimes at other objects. And as others of the domesticated animals were noticed to be liable to become affected with diseases in which delirium was a symptom, at the same time that the delirious disease was prevailing amongst dogs, it was inferred that the affection is communicated to the other animals by the dog, and through the medium of a bite.

It would almost appear that rabies in the dog, like typhus in man, is incompatible with a very hot climate.

All this was believed by the ancient Greeks, but they held that dogs thus affected had no particular disposition to bite the human species, and that if such an occurrence chanced, the bite was innocuous. "Dogs," wrote Aristotle, "are subject to three disorders,—the lyssa, the angina, and the podagra. The first of these maladies makes them mad, and all the animals that they bite become similarly affected, *man excepted*. This disease kills the dogs themselves, and every beast that is bit by a rabid animal, *man excepted*." The remark of Xenophon, in his account of the retreat of the Ten Thousand, seems likewise to imply that this madness was a disease peculiar to dogs. The citizens of Cerasus, he said, must have thought that some lyssa, like that of dogs, had attacked the Grecian troops.¹

A serious and fatal disease in men, however, characterized by barking and dread of water, and caused by the bite of a dog affected with the lyssa, was never described, and never supposed to really exist until the time of Asclepiades, one of the earliest of the Grecian adventurers that, attracted by the wealth and ignorance of the Romans, sought to establish themselves in their metropolis. This sophist commenced his career as a rhetorician, but not succeeding, he determined to try if medicine would be more auspicious. He had no previous knowledge, indeed, of the science or the art, but he seems to have trusted to fortune and to innovation,—the two sheet anchors of the many charlatans that have succeeded him. He denounced all violent or active remedies; a physician, he said, ought to cure diseases *tuto, cito, et jucunde*; he pretty much dispensed with the use of drugs and (for modern systems of regular medicine are but reproductions of older ones that have had their day and become obsolete) trusted principally to water employed in various manners. Not only did he prescribe beds of various degrees of elevation to his patients, but he had baths suspended in the air. Unlike the modern hydropathic, however, he was liberal in his use of wine, and a considerable part of his popularity among those who consulted him seems to have been attributable to this. Of course he had his jokes against the Hippocratic physicians, whose science he declared was a "meditation upon death." "Whatever the whole world affirmed," said Galen, "Asclepiades contradicted." Amongst the other novelties that he propounded was, that a dog afflicted with lyssa could by a bite communicate the disease to a man, and that the disease in men so communicated was characterized among other things by an inability to swallow fluids. From

¹ Anab. v. 7. 26.

this last circumstance it was named hydrophobia. Pliny speaks of the bite of a mad dog being deadly to man, and producing hydrophobia.¹

For two centuries, however, little faith seems to have prevailed with regard to the existence of this malady. Perhaps this may have been owing to the distrust felt by the more regular practitioners for any innovation proposed by Asclepiades. At any rate the hydrophobia was not patronized by any one until the time of Cœlius Aurelianus, who belonged not to the Hippocratic school, but to the Methodic, such as is now represented by the homœopathists and the hydropathics. This physician maintained the existence of the disease in question, that it was caused by the bite of a rabid animal, and that its symptoms were inability to drink, desire to bite, barking, convulsions, &c. These views of Cœlius seem to have met with great opposition. One party objected the improbability of a *new* malady like it being excited in the human species, and they maintained that before the time of Asclepiades no one had ever thought that he had seen such a disease. Cœlius, however, maintained that this was owing, not to the absence of hydrophobia, but the deficient observation of preceding generations. Others affirmed that the cases that he called hydrophobia were not corporeal but mental affections. Cœlius protested, however, that they were both the one and the other; in fact, hydrophobia suited well with the existing Methodic doctrines, and Cœlius made a determined stand in its favour.

And he perfectly succeeded. From his time down to the end of the last century the prevailing opinion among physicians, as is, indeed, yet the common opinion, was, that particularly during hot weather, dogs become affected with an acute disease, that is always mortal, and that is characterized by inability to swallow fluids, and the desire to bite; that the bite of a rabid dog communicates the disease to the domesticated animals and to man; that man so affected barked and was unable to drink and desired to bite, and that his saliva introduced into a wound was capable of exciting the disease in any other man whom he might so bite. Accordingly during the Middle Ages and up to almost recent times, it was considered proper to seize people who had been bitten by a rabid dog, and who showed a tendency to these symptoms, and to prevent them propagating the disorder by smothering them. Just too as, so long as witchcraft was a capital offence, people were found who had, by their own confession, all its symptoms; so individuals who had been

¹ Nat. Hist. viii. 63.

snap at by a dog, really barked, refused to swallow fluids, made efforts to bite, and were suffocated.

Notwithstanding, however, that the belief in hydrophobia was so strong, and the practice regarding it so decided, the opinions that were entertained regarding it by the medical men were singularly vague and unsatisfactory. Even when towards the close of the eighteenth century the nosologists began to systematize almost to refinement, the hydrophobia appears to have been a perfect Slough of Despond. Sauvages (1769) classed it among the depraved appetites, along with nostalgia or home sickness, and defined it as "a mad aversion for drinks, *often* from the bite of a rabid animal" (*sæpius a morsu animalis*). Linnæus (1763) makes two diseases of it, *rabies* and hydrophobia, both of which are placed among that class of mental diseases which includes nostalgia and "a loathing for mundane affairs." Rabies, he defines, "a desire to bite and tear innocent people *often* from an animal bite;" and hydrophobia, "an aversion for fluids with shivering and sardiasis ('*i. e.* a peculiar contraction of the muscles about the mouth') often combined with rabies." Vogel (1764) ranks the hydrophobia among febrile diseases, and defines it as "a fever with an aversion to liquids, hiccup, convulsions, and delirium." Sagar (1776) defines hydrophobia to be a disease of which the main symptom is an incredible aversion to all fluids and an impossibility of swallowing; "the affected man above all," he adds, "avoids the light and motion of the air." And our own Cullen ranks it along with hysteria among the spasmodic diseases of the nervous system; defines it as a horror of fluids, and separates it into two varieties, the one caused by the bite of a rabid animal and characterized by the desire to bite, and the other not having this tendency to bite, and, we presume, not supposed to be caused by the bite of a rabid animal.

When Cullen made this last definition he doubtless had in his mind (for he refers to it in a foot-note), a case that had occurred in the practice of his predecessor in one of the chairs of medicine in the University of Edinburgh, Dr. Innes. This case is not so instructive as some that have been recorded, but is nevertheless worthy of being extracted from its dust now more than a century old.

A young gentleman was, while walking during a hot summer day, attacked by a pain in his stomach, doubtless of a nervous nature, for which blood was drawn. During the following winter he had some slight returns of the pain, and again lost blood, and his nervous mobility doubtless thereby augmented.

" *April 2d, 1732.*—He went to bed in perfect health, was awakened next morning with a pain much like the former, though neither so exquisite nor equally sharp but that he could make a shift to put off with it, and even at some intervals sleep a little till ten next morning, when all of a sudden it became so violent as to force him instantly to call out for his old cure, a plentiful bleeding, on which for some minutes he felt himself entirely relieved, but soon after complained of a strange anxiety, difficult breathing, coldness of his extremities, and convulsions of the diaphragm.

" I saw him before eleven, when I found his pulse much oppressed, very irregular, and often intermitting; his extremities chilled; his breathing almost suffocated, fetching heavy sighs, and very often looking ghastly; spouting saliva frequently, and roaring out. . . . He was immediately bled, and seemed, for five minutes, somewhat relieved; then, all of a sudden, his extremities became cold and rigid as of a dead body, his pulse at no rate to be felt; immediately he cried out that everything was turning round him with strange rapidity. Soon after that he scarcely saw the objects, but imagined himself in such a motion. At last saw nothing, and quite bereaved of all his senses, raved in the most extraordinary manner, often starting up, and tearing everything about him; spouting perpetually great quantities of water, ready every moment to be choked in his breathing, making no complaints of his former pain, but crying out, in the most pitiful manner, how he was abandoned by all and left among flames that were consuming him, vowing eternal vengeance on all that had so used him.

" The tone of his voice often changed; he had convulsions, frequent in his face. . . . He had some intervals during that extraordinary shock, and called instantly for drink; but the moment he saw it, fell into the most surprising horrors, and, as it approached him, started, looked frightened, and frequent convulsions, especially about his mouth, and sullenly put it away with his hand; and then, with an air that spoke at once fright and resentment, he would stare after the drink, and soon after impatiently called for it, and repeated the same scene.

" After the last bleeding, finding himself more than ever before relieved, he called hastily for a little warm milk and water; he greedily glutted a mouthful, and that very moment with great force spouted it at a great distance, and, after it, an incredible quantity of saliva, in the same manner, with the same force; and very frequently telling that, notwithstanding all his burning thirst, to swallow it was impossible,

nor could he, without a kind of horror, hear of any kind of drink.”¹

Other and still more conclusive cases have been recorded by the very best authorities, and many unrecorded ones have doubtless existed. Pinel relates a very well marked one:—“There was a young French soldier who had certainly never been bitten by any animal. This person disliked his profession, and secluded himself. His comrades attributed this to cowardice, and, by way of playing a trick upon him, entered his chamber at midnight, beating the charge upon the drum, and crying that the Austrians had crossed the Rhine. Immediately he was seized with convulsions, a sensation of burning and tightness in the throat, a great dread of liquids, and the expectoration of frothy saliva. In the morning the horror of fluids was still greater, and his respiration and circulation became irregular. The symptoms increased, and he died. His body was examined, but no morbid appearance found.” Savriotte has recorded a very well marked case, in which there was every symptom of hydrophobia, which terminated fatally, and in which there had certainly been no antecedent bite. In fact, there are a great many recorded cases of decided hydrophobia, in which there has been no bite, although there has been some very powerful mental impression. Also, cases of hydrophobia have occurred and terminated fatally, in which a bite, indeed, preceded the disease, but the bite of a perfectly healthy animal. In *Hufeland's Journal* there is a case reported in which an individual died five weeks after having been bitten by a dog, with every symptom of violent hydrophobia; but the dog was perfectly healthy at the time of inflicting the injury, and remained so perfectly afterwards. And in a most melancholy case of a lady who died from hydrophobia at the beginning of the present century, in Scotland, it was generally understood that although a pet dog had become rabid, it certainly did not bite its mistress, though perhaps it scratched and alarmed her.

During the last fifty years, however, very great changes of opinion have gradually taken place with regard to both rabies and hydrophobia. The pathology of the lower animals has passed from the farmer and the whipper-in to the hands of educated and skilful veterinarians. The disease *rabies* is still recognised, but it is ascertained that the animals affected by it have no dread of water; that in most cases there is no difficulty of swallowing fluids; that increase of or

¹ Medical Essays and Observations, vol. i., p. 283. Ultimately this patient recovered.

any alteration of the salivary secretion is frequently unnoticeable, and that the disease has no necessary connection with hot weather. Recently the idea that dogs might take rabies without being bitten by a rabid dog began to be entertained, and doubts suggested themselves whether, whatever might be the case with the dog, other rabid animals had the power of propagating the disorder by means of a bite, or, indeed, in any other manner.

The sentiments entertained by the medical men with regard to hydrophobia in man have also undergone a considerable change. Human beings bitten by a rabid dog are no longer thought to bark or desire to bite, and their saliva, by almost all, is regarded as innocuous. Strangely enough, as soon as these became prevalent opinions, although people bit by rabid dogs from time to time take a disease under the influence of which they die, the barking and the propensity to bite ceased. Then the difficulty of swallowing fluids began to be thought an occasional symptom only; and in fatal cases of hydrophobia lately recorded this is not a constant or prominent symptom.

A very great preponderance, too, of the supposed cause over the effect began to be noticed in rabid dogs with regard to their power of communicating the disease. A dog affected with furious madness, as it was called, that is, a case of rabies in which the delirium was strong, ran about the country snapping at every thing and animal that came in his way, and yet most of these bites clearly produced no evil consequence. It was ascertained, for instance, that of twenty people bit by an individual mad dog, nineteen were only injured by the scratch, and experienced no further ill consequences, while, were it possible to compute accurately the number of animals and men thus snapped at, and in whom no disease was set up, it would probably amount to many hundreds. In etiology, indeed, perfect exactitude is not expected, and when it is uniformly observed that out of every twenty exposed to an obvious cause, nineteen, eighteen, or sixteen became affected by a certain disease, that disease is believed to have been excited by that cause. But when the same circumstance is applied to two, three, or five hundred similarly situated individuals, and a disease is only set up in one single instance, that circumstance cannot be considered as an exciting cause of the disease. Moreover, young children, although exposed to the cause, were not noticed to be affected by the supposed result. These and the observations, that a disease in every respect resembling hydrophobia, and ending fatally, could be excited in the human species without any bite of a dog or other rabid animal, made more

than one physician doubt if the saliva of a rabid dog had the power of exciting any disease whatever in the human constitution.¹ The late Sir Isaac Pennington, professor of medicine at Cambridge, for instance, denied the existence of any such disease.

Quite recently, too, considerable scepticism has begun to arise among the veterinary gentlemen regarding many points in the pathology of the disease called rabies in the dog and other domesticated animals. The subject has been particularly investigated by Professor Dick, and he has come to the conclusion that the saliva of a rabid dog introduced into the system of another dog has no power of inducing any disease whatever.

Still there is no doubt but that there is a disease that occurs in dogs and other domesticated animals that is of an acute nature and terminates fatally, and which, in many respects, corresponds with the described rabies. It is also certain that members of the human species, who have been bitten by rabid animals, occasionally become affected by an acute and fatal disease that in many respects resembles the malady described as hydrophobia. And it certainly is of importance that our knowledge upon these two subjects should be exact.

That rabies in the dog is not produced by heat is undoubtedly true. Indeed, some of the hottest countries, as many parts of South America, have never known the disease. The dogs of Madeira, too, who, besides heat, have to endure all sorts of privations from thirst and from famine, have never had a case of rabies among them. A very cruel experiment in this respect was tried at the Veterinary School of Alfort. Three dogs were selected, during the heat of summer, and chained in the full glare of the sun; to one salted meat alone was given; to another water alone; and to the third neither food nor drink. All three died, but none of them showed the slightest symptom of rabies. Other similar experiments have been performed upon dogs with exactly the same negative result. Moreover, the disease certainly, when it is prevalent, rages as much and as intensely when the weather is cold as when it is hot, and one statistical writer upon the subject declares that one of the two months during which the disease is least frequent is August, the very hottest month of the year.

Whatever may be the popular opinion, no writer on the subject of rabies for many years past has defended the old belief that heat produces rabies. A still more important

¹ Bosquillon and Gerard both denied the existence of a specific hydrophobia, and Mr Green vaccinated himself with rabid saliva to indicate his scepticism.

fact is, that all the negative evidence goes to prove that in a dog or other domesticated animal, the disease is not excited or caused by a *bite* of an animal previously affected. Even Youatt, so strong an advocate for the origin of rabies in the bite of a previously rabid dog, confessed that he had often examined rabid dogs on whose bodies there was no wound or the slightest indication of any injury. But, which is still stronger evidence, the rabies has often broken out in carefully-kept kennels, where there was no possibility of its having been introduced from without by means of a bite. A great many instances of this might be brought forward. We may cite just two. When rabies was, in 1849, prevailing epizootically in Scotland, the kennels of Sir John Ogilvy and Lady Menzies became affected, and in both cases it was certain that there had been no access of strange dogs; that is to say, the disease unquestionably occurring in these kennels had originated without a bite, and therefore not by inoculation from a previously rabid dog.

Perhaps a still more decisive argument against rabies having its origin in the bite of a previously rabid dog may be brought forward; viz., that rabies is essentially an epidemic, or rather epizootic disease—it prevails for a number of months (during which great apprehension is excited), and then nearly altogether disappears for a number of years. In the south-east of Scotland, for example, where the existence of an active veterinary school renders it easy to obtain a history of the diseases that occur among the domesticated animals, it broke out in 1835, and continued most virulently for about fourteen months; and again, in 1849, when it continued for about eighteen months. But for many years before 1835, in the interval between the epizootic of 1835–36 and 1849, and since its cessation in 1850, it has not prevailed at all, no case having been brought to the school, and only an occasional rumour being heard of supposed cases having happened in country districts. It is clear that if rabies be an epidemic disease, raging for a while and then disappearing, and remaining absent for years, that either it is not excited at all by a bite, or that it requires something else besides the bite to induce it.

In support, however, of the belief that rabies in dogs and other domesticated animals is of an infectious nature, great stress has often been laid upon the fact, that the disease has often been apparently communicated from one dog to another by inoculation of the saliva. As before stated, it is indeed universally admitted in etiology that we must not expect any event to occur uniformly antecedent to any dis-

ease, in order to pronounce that event the cause of that disease. In fact, we never see any cause invariably setting up a disease. A peculiar miasm, we admit, is the cause of typhus ; but there are a few people who, let them be exposed to the contagion as abundantly as possible, never take the fever. Again, the miasm of small-pox unquestionably produces that disease, but there are some individuals who may be inoculated with the variola virus with perfect impunity. Some peculiar atmospherical influence induces cholera, but that fatal epidemic never attacks every individual in an affected district. Accordingly, the fact, admitted on all hands, that the saliva of a rabid dog inoculated into a healthy dog *sometimes* fails to induce rabies, is not of itself evidence that the cause of rabies is not the saliva of a previously rabid dog.

But it has always been held, and surely with propriety, that while a certain amount of laxity from exceptional cases is admissible, two conditions are necessary in order to connect a cause with a disease. 1st, The great majority of those who take a disease must have previously been exposed to this common antecedent ; and 2dly, No other common cause must go before the disease, to which the disease may, with greater probability, be ascribed. Of those fairly brought into contact with the contagion of typhus, as hospital nurses and the like, it is hardly too much to say that not one in five hundred finally escapes the disease, and nothing extraordinary, save the exposure, is common to the four hundred and ninety-nine, or to the whole five hundred that do take it. Of a thousand people (who have not had previous small-pox or been vaccinated) who are inoculated with small-pox virus, nine hundred and ninety-nine are affected with that malady, and but one escapes, and there is nothing common to the nine hundred and ninety-nine save the inoculation. In such cases the exceptions may surely be disregarded, and a confident opinion, or rather decision, come to as to the cause of the typhus and the small-pox.

With regard to the cholera, indeed, the case is not so plain. This disease prevails extensively, but only attacks a moiety of those exposed to it, and after a time it disappears. Inoculation with the blood, or with any secretion from the body of a cholera patient, does not induce the affection, nor can the malady be traced from one individual back to another, after the manner of the typhus. On the contrary, it attacks numbers suddenly at once, ravages for a time (always, however, less than the moiety of a district), and then vanishes. The cause of this complaint is clearly of a tem-

porary, and, in one sense, of a local nature ; and, as we see it steadily progress across vast tracts, we naturally ascribe it to some atmospherical influence. We explain the comparatively small number attacked partly by the consideration that its cause does not come in sufficient virulence into contact with every one, and partly by observing that its exciting cause has only effect upon individuals who are also affected with predisposing causes, such as a proportion only, often a small proportion, of a community are under the influence of.

And we are farther grounded in this belief, by observing that several diseases prevail from time to time among a community in this manner, *i. e.*, suddenly and extensively, and unconnected with any limited local cause, or with contact with previously diseased persons, or epidemically ; and that these epidemics never affect more than a portion of the inhabitants of any invaded community, and generally less than the half of them.

On the other hand, when we inoculate a person with small-pox matter, and he becomes affected with the small-pox, we attribute the disease to the inoculation, because we always, or nearly always, find it produced either by direct inoculation or by the man having had natural inoculation from being exposed to the effluvia from the body of a man having small-pox ; and we never see this affection without being able to trace either inoculation or such exposure. Or, if in a street where dwelt two hundred people a man take typhus, we can almost invariably find that he has been seeing some other person in some other street who had that fever. Then his wife takes the disease, then the neighbour that waited on his wife, and so on, until, say fifty in that street have had typhus. In tracing the history of the disease in this street, we can find its introduction, and then its regular progress from one inhabitant to another. In another street having the same number of inhabitants, or in the same street, invaded by cholera, a great number take it simultaneously ; and of those that take it after its first appearance, no contact with affected cholera patients is to be traced, at least, as a common circumstance. Fifty, however, of the residents may suffer from cholera in that prevalence of it ; and we decide that the disease is epidemic, and that it depends upon some general cause, probably atmospherical, that prevails in the street.

If, however, some zealous pathologist, as soon as he heard that cholera has attacked that street, ran and got some blood or saliva from the first cholera patient he could get hold of, and inoculated the whole two hundred inhabitants

of the street with it, we should never pronounce that the fifty subsequently attacked with cholera were so in consequence of the inoculation ; but we should decide that the same men would have taken it if they had not been inoculated, and that, in fact, the inoculation had nothing whatever to do with the disease.

What is the evidence in this respect with regard to rabies in the dog? Youatt, a strong advocate of the injurious nature of rabid saliva, inoculated, during the epizootic that raged in London in 1829, dogs with the saliva of dogs undoubtedly rabid, and the "inoculation failed as often as it succeeded." That is to say, that while an epidemic of rabies was prevailing, which was attacking say one-half of all the dogs in London, it attacked also a moiety of a number that had a particular experiment tried upon them. Is it likely that it was the experiment that was the cause of the rabies? A still more striking instance of this occurred at Berlin. Dr Hertwig, of the Veterinary School in that city, went on inoculating dogs for five years—he experimented altogether upon fifty-nine. Of these, forty-five were in no ways affected ; and fourteen (who would probably have taken rabies just when they did if Dr Hertwig had never been born) had rabies subsequent to the inoculation.¹

Rabies in the dog and other domesticated animals would appear in every respect to resemble those epidemics that affect man, and depend upon temporary atmospherical causes. It breaks out suddenly, prevails extensively, and suddenly disappears, not to be seen again for years. During these intervals of absence no exposure to heat, or thirst, or inoculation with saliva of previously rabid dogs can produce it. And if dogs be exposed to such agencies when it is prevailing, it is fair to conclude, that they take the disease not in consequence of such exposure, but because the malady is at that time epidemic, or, to speak correctly, epizootic.

The etiology, indeed, of all the non-contagious epidemics is so obscure, that there has always been a great desire manifested to refer them to contagious emanations from the bodies of previously affected individuals, and not to some sudden and general cause. Thus many, quite in opposition to what has been observed of the disease, have attempted to maintain the infectious nature of cholera, and to explain in

¹ The perseverance with which some of these experimenters conduct their operations is almost amusing. Dr Hertwig inoculated one terrier no less than nine times in the course of three years quite unavailingly ; and an unfortunate dog at Charenton was unsuccessfully worried by thirty mad dogs from time to time.

that manner the sudden invasion, extensive prevalence, and rapid disappearance of that epidemic. Even Cullen put down influenza, an epidemic disease, as a *catarrhus a contagio*. And even those who perceive that the visitations of these diseases are too sudden and wide-spread to be accounted for in such a manner, can only refer them to an unknown condition of the atmosphere, and state that these epidemics thus produced almost invariably attack the mucous membranes, and that the domesticated animals are as much exposed to such diseases as the human species. They would seem, too, never to entirely disappear from a country that they have once invaded; although, when not raging, their attacks are very far between. An epidemic of cholera, or of influenza, for instance, attacks a country, and in the course of a few days thousands are affected; and, after a time, the epidemic disappears from public notice for a number of years; but, in the interval between two epidemics, an occasional sporadic case will occur, probably in some individual so strongly predisposed to take the disease, that he is affected by causes which have no influence over other men.

Like all such epidemic diseases, rabies is of an acute nature, and, as was pointed out by Youatt, and has indeed been long known, it is always characterized by inflammation of the mucous membrane of the fauces, often extending to the windpipe and stomach. "In the early stages," says Youatt, "there is always inflammation of the fauces," and the membrane covering the epiglottis is inflamed." Rabies, indeed, would appear, in its earlier or milder form, to be nearly identical with influenza among men,—an epidemic febrile disorder, attended with inflammation of the mucous membrane of the back of the mouth and adjacent parts. Subsequently, at least in the cases that, from the severity of their symptoms, attract notice, and receive the name of rabies, there is violent delirium.

Destructive to the feeble in health as the epidemic inflammation of the mucous membrane about the nose, fauces, and air-passages, called influenza, is in the human species, rarely or never is accompanied by violent delirium. On the contrary, fatal cases of it generally terminate, owing to the depressing effect of the disease upon the whole system, and not from any extension or transference of the inflammation to the brain. Is there, however, anything in the anatomy of the domesticated animals, particularly of dogs, to make us apprehend that an inflammation of the fauces, of some days' continuance, would probably implicate

the brain, and produce a disease of which delirium would be a probable symptom?

It certainly would appear that there is. In all these animals, and especially in the dog, the organs of smell are very highly developed, and the ethmoid bone is truly "cribriform," that is, sieve-like. And when we consider the extent and complexity of the nervous matter between the mucous membrane of the nose and fauces and the brain, we can easily suppose that inflammation of the former might spread to the latter, and in such a case delirium be a symptom; and that this transference should be most frequent in the dog, that domesticated animal in which the olfactory powers are most developed of all.

So probable and so reasonable does this explanation and cause of the delirium of rabies seem, that, in the absence of contradictory facts, we might assume it as the true account of the pathology of the disease. But we have observations that confirm it, and we are informed that in every fatal case of rabies examined in the Edinburgh Veterinary College, whether in dogs, horses, or cattle (no sheep were examined), the brain behind the ethmoid bone was found with every mark of severe inflammation. Two morbid appearances are common to all cases of rabies, two only, but these two invariably; inflammation of the mucous membrane near the termination of the olfactory nerves, and inflammation of the brain in that portion of the brain nearest to where these nerves leave that organ.

If this be the true account of rabies in the dog, if it be an epidemic catarrh, produced by some peculiar atmospherical influence, attacking the mucous membrane at the back of the mouth, and only accidentally inducing delirium, and ending fatally by extending to the brain, and if the saliva of the affected animal be unchanged and innoxious, there is an end to the belief that the bite of a rabid dog can produce hydrophobia, or any other specific disease, in the human species. But even setting aside all this, there is other evidence sufficient to disconnect the so-called hydrophobia and rabies, and moreover to establish the true nature of the disease that does sometimes come on in a man that has been bitten by a rabid dog.

That a special and peculiar disease in man should be induced by the bite of a rabid dog, is very improbable, owing to the fact that the bite of such an animal is seldom attended by any evil consequences. Hydrophobia is a very rare disease; rabies, during the prevalence of an epidemic, a very common one; and many persons who never suffer the slight-

est after inconvenience, are bitten by rabid dogs. Supposing, and the supposition is an exaggeration, that half the people so bitten run to a surgeon and have the wounded part cauterized or excised, we have the remaining half who take no such precaution. Of the number of these latter, some idea may be formed from the evidence of Mr Youatt: "I was telling," he said, "the surgeon to whom I have just referred, that I had operated on nearly *four hundred* persons, and had been invariably in the habit of using the lunar caustic, and not one had died;" his reply was, "What is your *four hundred* compared to the number I have seen since I became connected with St George's Hospital: myself and colleagues have operated on more than as many *thousands*, and to our knowledge not one has been lost.

This is the experience of one London hospital, and when the other hospitals, dispensaries, &c., are taken into account, the number of people bitten by dogs in London becomes very great. Assuming that nine-tenths of those that chanced for some years before the inquiry to be bitten were bitten by healthy dogs, although the animals were imagined to be rabid, still the number of people bitten by dogs really affected must have been very great. Admitting in the meantime that the excision or cauterization would protect those who were thus treated, the moiety who neglected this precaution must have been very considerable. And yet the hydrophobia of a man during this period was scarcely known in the metropolis. All the medical men who were examined before the committee of the House of Commons in 1830, many of whom were in extensive practice, and all of whom were zealous advocates for the disease, agree as to its extreme rarity. Mr Todd Thompson stated that the first twenty years that he was in practice he never saw a single case, but that within the last ten he had seen *three* instances. Mr Earle, in his twenty-five years' experience at St Bartholomew's (where ten or twelve bitten people would be cauterized in a week), had seen "living or dead" *nine* cases; Mr Travers, notwithstanding his connexion with St Thomas's, had witnessed only *ten* cases, and he stated that in twenty years only five cases arrived at St George and St Thomas's; Dr Abington did not count his, but said, "it has not occurred to me to meet very lately with any case of the disease, and though I should be able to go a good way back in the enumeration of the cases I have seen they are not very numerous;" Sir Benjamin Brodie began his studies in 1801, and was always intimately connected with St George's Hospital, "where a great number of persons came who had

been bitten by dogs supposed to be rabid," and "where a considerable number must have been so," and yet from 1801 to 1816 "he never saw a case of canine madness (in man) nor was there any one admitted into St George's Hospital. Since that period there had been several." The other medical witnesses seem to have seen just one case a-piece.

If these bites from rabid dogs occurred in thousands of cases, in a great many of which no application of caustic was made, and only some since so bitten had the hydrophobia, it would be difficult to connect the bite with the disease. In point of fact, however, in the vast majority of the cases bitten by dogs, admittedly rabid, and in which no hydrophobia appeared, the caustic *could* not at all give protection against the disease if really infectious. The action of caustic upon a poisoned wound is simple; when that salt is applied to an animal texture, the nitric acid combines with the water that is essential to all animal structures, and the whole part touched is thereby destroyed and disorganized, including among the rest the organs of absorption. When these organs of absorption are so destroyed, if any poison be present it cannot be absorbed and taken into the system; and, therefore, cannot produce any deleterious effect. But any poisonous fluid placed in an open wound would certainly be taken up, perhaps in three, certainly in twenty minutes; and cauterization, after that time has lapsed, can have no prophylactic effect. Very rarely, however, is the caustic applied so soon as this; and usually days, and often weeks, are allowed to elapse between the infliction of the bite and the application of the caustic. Indeed, any time within a fortnight seems to be held to be immaterial.

The case, then, is this. In one large city (and other cities are quite analogous in this respect) thousands and tens of thousands are bit by rabid dogs; the immense majority of these forget all about it, and a very trifling number, not perhaps two dozen (and some of whom had probably never been bitten at all), after an interval of months, or even, according to some, after an interval of thirty years, take a disease. Is it likely—is it credible, that this disease arises from morbid matter proceeding from the mouth of a dog suffering from delirium consequent upon epidemic catarrh?

In those rare, very rare, cases which resemble the described hydrophobia, and in which there has been a bite, both the symptoms and the fatal event may be explained in one of two manners.

There is a disease, not a very common one, but sufficiently so that almost every medical man has seen an instance of it,

and of which some hundreds of cases occur every year in Great Britain, called "traumatic tetanus." It is a complaint that very generally terminates fatally—is characterized by violent convulsive spasms of the muscles, and is caused by a wound, almost always a punctured wound, of a nerve. A man, for example, has his hand lacerated by a nail; in the course of a few days, and while the effects of the injury are to be seen, this dreadful convulsive disease occurs, and, in the majority of cases, after three or four days' suffering, the man dies. If the puncture be inflicted, instead of a nail, by the tooth of a dog, why should not this same tetanus come on?

But while it is clear that the bite of a dog may induce fatal traumatic tetanus, it must be admitted that most of the reported cases of hydrophobia do not resemble tetanus. In the latter disease a man receives a wound; he thinks nothing of it, save how long it will be before it heals, and never gets apprehensive about tetanus, of which, perhaps, he knows nothing; in a little time the tetanus comes on, he suffers from violent convulsions, but his mind manifests no imbecility or peculiarity, and he hopes to get better. But in hydrophobia the case is very different; in it the affected man is almost always, indeed always, of what is called a "mobile" nervous habit or system—a long interval elapses between the injury and the access; during which he reads books about hydrophobia—consults with his friends about the disease—gives orders as to what must be done *if* he take it—and when, after a long period of anxious dread, his nervous system gives way, and convulsions come on, although no delirium be present, there is a decided affection of the mental faculties;¹ and the patient never appears to think about getting better.

In short, while it is clear that the cause of small-pox is the reception into the body of a poison, and the cause of tetanus the physical injury of a part of the nervous system, we must refer the great majority of cases of hydrophobia to that class of diseases which includes hysteria, trance, ecstasy, &c., and which are characterized by violent disorder, generally of a convulsive nature, of the muscular system, and which are produced by moral causes.

All these diseases occur only in one class of people, the members of which are said to possess *mobility* of the nervous

¹ This will be evident to any one who will go through the recorded cases. It is noticed by Dr Watson. "In general," he writes, "the patient is dreadfully irritable, and apprehensive, and suspicious; and, in most cases, there is a degree of mania or delirium mixed up with the irritability; the sufferer is very restless and talkative. In this respect, there is a marked difference between hydrophobia and tetanus."

system—a state in which sensations and emotions are too acutely felt, and have a far stronger and more lasting impression and effect upon the body than is seen in ordinary individuals, whose muscular system is little under control, and who have the *animus, nec sponte, varius et mutabilis*. It is in such individuals that moral or mental causes excite these diseases, all which powerfully affect the nervous system so as to produce the most violent spasms. These muscular contractions thus produced are more violent in hysteria than in hydrophobia; but cases of hysteria are rarely (at least rapidly) fatal, owing to so long intervals occurring between the paroxysms—whereas, in the hydrophobia, they succeed one another so rapidly, and the state of mind is so desponding, that these, combined with the inability to sleep which seems to belong to this disease, exhaust the patient, and fatally depress the circulation of the blood.

One link only is wanting in the chain of proof that decidedly assigns hydrophobia a place among these convulsive diseases of the nervous system produced by moral causes, and that is, cases of well-developed hydrophobia that have been cured by the application of a moral remedy. Many very decided cases of this might be brought forward. Perhaps, however, the following, for the correctness of which we vouch, may suffice:—A gentleman of gentle disposition and somewhat refined habits and pursuits, who possessed decidedly the mobile mental constitution, met with a very severe domestic calamity, which greatly depressed his spirits and increased this mobility. He was bitten by a dog that was violent and delirious, and supposed to be rabid (it was destroyed). This wound was well cauterized. Some weeks afterwards, strong excitement and convulsive movements came on, he believed that he could not swallow fluids, and his alarm and excitement became fearful. Fortunately, he was seen by a medical man who had very strong suspicions of the “moral” nature of hydrophobia; and he requested a distinguished veterinarian of his acquaintance to interfere. This gentleman visited him, and found him in a state of extreme excitement: he made use of a pious fraud, and assured him that he could not possibly have hydrophobia, because the dog that bit him had certainly not rabies, but some other disease. The patient anxiously inquired if he was sure, and on the statement being emphatically repeated, the excitement passed away, the convulsions ceased, he fell asleep, and in a little time awoke quite well.

It would, indeed, seem that the very important subject of the involuntary action of the mind upon the body, both in

apparently healthy and in decidedly diseased states has never yet received that degree of attention from either the physiologist, the pathologist, or the general philosopher, which the extent and frequency of its operation deserve. And yet, perhaps, many occurrences at present inexplicable, might, were its action better understood, be rendered more clear; and many of the events that are continually happening, and which the incredulous regard as impositions, and the credulous as miraculous, might turn out to be neither, and to be explained by it.



